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A combined sensory-instrumental approach for apple texture profiling

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Apple texture attributes, as crunchiness and juiciness, are important quality features which affect consumer's appreciation [1]. Although previous studies proved the usefulness of instrumental characterization of textural properties, sensory analysis can directly measure physico-mechanical differences which are perceived by consumers.

In this work we implemented and applied to 21 apple cultivars the combination of sensory and instrumental techniques in order to provide an effective characterization of their texture. The cultivars, selected from a large collection at Fondazione Edmund Mach, well represent the expected variability on the basis of a previous phenotyping [2]. Sensory profiling was provided by a trained panel, which developed a consensus vocabulary including 7 texture (firmness, crispness, juiciness, crunchiness, flouriness, mealiness, fibrousness), 2 visual and 6 odour/flavour attributes. On the same samples, mechanical and acoustic response under flesh compression have been simultaneously recorded (TA-XT texture analyzer equipped with an Acoustic Envelop Detector). This instrumental characterization has shown to be a promising strategy for dissecting the fruit texture variability [2].

Both sensory and instrumental profiles were effective in describing and discriminating the apple cultivars. PLS regression between sensory and instrumental data provided models with good predictive performances: cross-validated $R^2 >$ 0.81, for all attributes with the exception of juiciness (0.71). This indicates that juiciness perception is modulated also by chemical stimuli that are not accounted for in our instrumental textural data. Calibration models considering both mechanical/acoustic data and chemical composition data are under study.

Our results, from a large cultivar selection, show that it is possible to quantify some important perceived apple characteristics related to texture by sensory methods and that our rapid instrumental approach can predict some important textural attribute. We propose it as a valuable tool for cultivar evaluation in breeding programs and possibly also for quality control.

[1] Harker et al. (2003). The case of fruit quality: an interpretative review of consumer attitudes and preferences for apples. Postharvest Biol. Technol. 28, 333–347

[2] F. Costa et al. (2011). Assessment of apple(Malus×domestica Borkh.) fruit texture by a combined acoustic-mechanical profiling strategy. Postharvest Biol. Technol., In press, doi:10.1016/j.postharvbio.2011.02.006

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